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# FOREIGN TECHNOLOGY DIVISION

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EXCITED LIGHT SCATTERING TECHNIQUES FOR STUDYING MAGNETIC MATERIALS

Chang P'eng Hsiang

The use of photons as a means to probe into the primary excitation spectra of solids and liquids is a well known and fruitful area of research. However, for a long period of time, inelastic light scattering techniques have been limited in their applications to transparent or semi-transparent materials mainly. Most magnetic materials are nevertheless opaque and cannot be studied by this method. Recently, thanks to improvements in instruments, especially the appearance of multi-passed Brillouin scattering apparatus, much higher resolution and contrasts have been obtained, thus opening a new world for the study of opaque and even metallic materials and good prospects for the study of magnetic materials using excited light scattering techniques. Research performed during the past few years has shown that this is an interesting field as well as an effective tool. By examining the exchange of energy and momentum between the scattered light and the primary excitation in the materials, one can study the energy spectrum of the primary excitation as well as the interaction between light and primary

excitation and that between the primary excitations. For instance, the bulk spin waves and bulk acoustic spectra of iron oxide materials have been examined; excitation of bulk spin waves, surface spin waves and surface acoustic waves in metals and amorphous ferromagnetic alloys has been studied [1]; moreover, standing spin waves have been detected in thin film materials by means of light scattering techniques [2]. By examining these primary excitations, one can accurately deduce such important parameters as elastic modulus, saturated magnetic susceptibility, g factor and spin wave stiffness coefficient D. As the exciting light beam can be confined to a small region, different regions of the same material can be characterized. The above measurements are all made on the spin waves and acoustic waves excited thermally in solids. Another important facet is the study of externally excited pseudo-particles, e.g., the spin waves excited by the interaction of microwaves with the magnetic field. This way, one can obtain information regarding the excitation frequency spectrum, relaxation process, nonlinear effects, etc.

This is a newly developed area of research. Initial results have indicated some differences such as asymmetrical distribution of scattered signals and incongruousness of the spin wave stiffness coefficient obtained with that obtained by other methods. This means that much more efforts are required in the theoretical as well as experimental work.

## REFERENCES


[1] P. H. Chang, A. P. Malozemoff, M. Grimsditch, W Senn, and G. Winterling, *Solid State Commun* **27** (1978), 617.

[2] A. P. Malozemoff, M. Grimsditch, J. Aboaf, and A. Brunsh, *J. A. P.*, **50** (1979), 5885.

FOURTH NATIONAL CONFERENCE OF MAGNETISM AND MAGNETIC MATERIALS HELD IN SZU CH'UAN

Yü Chih Hung

The Fourth National Conference of Magnetism and Magnetic Materials sponsored collectively by the Chinese Electronics Association, the Chinese Physics Association and the Office of Magnetic Materials and Parts Information of the Production Department was held in Ching Hsien of Szu Ch'uan during the period from November 26 to December 1, 1979. 332 delegates attended the conference. 241 papers were presented at the conference. Except for the specially contracted papers that were richer in content and presented at the general meeting, most of the papers were given at the various group meetings. These groups include: Fundamental Theories Group, Permanent Magnets Group, Paramagnetic Iron Oxide Group, Paramagnetic Metals Group, Microwave Iron Oxides Group and Magnetic Storage Medium and Parts Group. The attending delegates exchanged opinions at the meetings and during intermissions. Everybody agreed that, compared to the Third National Conference of Magnetism and Magnetic Materials held in 1975, our researchers in the field of magnetism have made fairly good progress in such areas of magnetism as amorphous magnetic materials and magnetic bubbles that have become active in recent years. However, compared with international standards, there is still a lot to be desired in the breadth and depth of our work and the quality of our papers. Alongside the conference, an organizational meeting of the Special Committee of Applied Magnetism of the Electronics Association was held. The organization and duties of the committee were specified, and arrangements for next year's academic activities were made.

## OUR FIRST MOLECULAR BEAM FACILITY SUCCESSFULLY COMPLETED

Ta Hsing

From December 18 to December 21, 1979, the Second Office of China Academy of Science sponsored in Shen Hsien an "Evaluation Conference for the Scientific Research Achievement in Molecular Beam Facility". More than 100 delegates attended the conference. The delegates listened to reports on the design, fabrication, installation, testing and sample growth. The conference passed the evaluation report drafted by the Evaluation Committee headed by Deputy Chief of the Office of Metals, Comrade Kuo K'e Hsin.

The molecular beam facility fabricated under collaboration of the Physics Research Institute of China Academy of Science, Office 510 of the Seventh Machinery Department, Scientific Instruments Factory of China Academy of Science in Shen Hsien, and Pei Ching Scientific Instruments Factory is a large-scale precision equipment developed on the basis of ultra-high vacuum technology by combining electro-optics, energy spectra, weak signal detection, precision machinery processing and similar modern technologies. The results of the evaluation indicated that the major functions of this facility are near or on the level of similar facilities built abroad.

Our first molecular beam facility being successfully fabricated has filled an empty page in our scientific research. This is a very important achievement indeed.

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